Environment Bay of Plenty
REGIONAL COUNCIL

River Gravel Management Guidelines

Environment Bay of Plenty
Guideline No. 2003/02
November 2003

Working with our communities for a better environment

Acknowledgements

These guidelines were developed by Amy Reid with assistance from Edwin Parkes, and Tony Dunlop, together with information and help from the Technical Services and Consents and Compliance Sections.

Many thanks to the Word Processing/Desktop Publishing Team for their formatting and layout skills and to the Graphics Design Section for their assistance with the graphics in the document and creation of the cover page.

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Chapter 1: Introduction

1.1 Background Information

Gravel has been excavated from rivers in the Bay of Plenty for over fifty years. There are two key reasons for this:

(a) *River stability and flood management purposes*

Environment Bay of Plenty has a direct responsibility under the Soil Conservation and Rivers Control Act 1941 (SCRCA) for river control and flood management. Planned gravel removal at specific locations is necessary for the maintenance of channel flood flow capacity and the integrity of the major flood control schemes (i.e. the Rangitaiki, Whakatane, and Waioeka-Otara).

(b) *The demand for construction and roading aggregate in the Bay of Plenty and the associated economic value of the resource*

Sand and shingle components of gravel are two resources that are an important source of building and roading aggregate material.

Management of the gravel resource is based on Environment Bay of Plenty's responsibility under (a) with appropriate recognition of the demand for sand and shingle products under (b). In areas where riverbeds are aggrading and gravel removal is desirable, this can work to the advantage of both Environment Bay of Plenty and gravel users. Occasionally gravel needs to be removed to control aggradation, even though there is low demand for the gravel. In other circumstances the bed of rivers is degrading and the removal of gravel is undesirable. Further to the need to establish a balance between supply and demand for gravel and the need to control the beds of rivers, the excavation of river gravel can conflict with the maintenance of natural, cultural and recreational values of our region's rivers and consequently may cause adverse environmental effects. Environment Bay of Plenty's Regional River Gravel Management Plan establishes controls over the effects of gravel excavation. Essentially this plan seeks to avoid, mitigate or remedy these effects. This guideline document provides further information on the obligations of, and requirements for, people undertaking gravel excavation in the Bay of Plenty.

1.2 Specific Objectives of these Guidelines

The specific objectives of these guidelines are:

- To provide reference material on gravel management which amongst other things, can be used for education, regulation and environmental improvement.

- To complement the regulatory controls contained in the Operative Regional River Gravel Management Plan; and

- To provide gravel excavators with comprehensive guidelines for gravel excavation, which:

  - Outline the reasons for, and principles of, well managed gravel excavation;

  - Provide information on gravel sources and processes, and the effects that excavating gravel has on these;

  - Detail the statutory and administrative framework for gravel management in the Bay of Plenty;

  - Outline data collection and survey methods used to monitor, and consequently understand, the movement of gravel down rivers, and the effects excavation is having on the river and surrounding environment;

  - Outline the current extent of gravel excavation in the Bay of Plenty and the desirable excavation and bed levels;

  - Provide a series of operational guidelines for gravel management that set out specifications and standards for gravel excavation practices in the Bay of Plenty; and

  - Identify the principles and operating procedures that will be followed to avoid, remedy or mitigate the adverse environmental effects of gravel excavation.

Chapter 2: Background Information on Gravel Excavation in the Bay of Plenty

2.1 Gravel Sources and Processes

Rivers transport sediment (including gravel) that is produced by erosion in their catchments and channels. The amount of gravel entering a river system depends on river catchment factors such as:

- area and topography;
- rock type;
- geological processes (including earthquakes, etc);
- climate (rainfall, wind, temperature variation) and climatic events (i.e. cyclones);
- vegetative cover; and
- land use.

The distance that gravel is transported before being deposited depends on both particle size and water velocity. The coarser material is deposited in the riverbed where the grade of the river decreases and this is often where the river emerges from hills onto plains. As the river grade flattens, its velocity decreases and it deposits progressively finer material. Some gravel material is carried to the coast and this forms an important source of sand and silt material for the cycles of beach erosion and deposition.

During a flood, the dynamics of a river system change and gravel that has previously been deposited can be reworked from the riverbed or eroded from its banks and transported by floodwater further downstream. Typically, the transportation and deposition of gravel is a complex process and the riverbed itself acts as both a storage area and a supply source.

The deposition of gravel on the inside of river bends increases the erosion pressure on the outside of the river bends and this causes the river to gradually change course. Although these changes are negligible where rivers flow through hard rock, it is likely that there will be significant changes where rivers flow through alluvial deposits. Consequently, in such places the river course can change dramatically every time it floods.

Excessive erosion in the catchment of a river can cause a cycle of riverbank erosion. This cycle will occur when natural gravel supply exceeds a river's ability to transport it through the river system. Where a river is actively fed with material from erosion in its catchment the excessive supply of material will cause river banks to erode as typically water carrying sediment has greater erosive power than clean water. In this situation, the riverbed builds up with gravel deposits on river beaches leading to the formation of islands. This in turn forces the river water to flow towards the banks which increases bank erosion.

In other rivers, where erosion in the catchment is minimal, there is no measurably significant source of supply. The gravel that exists in the bed has either been there for a very long time or is being supplied from the bed and banks further upstream (i.e. from previous deposition).

If gravel is removed from a riverbed, the river will try to re-establish the same grade by eroding the up-stream bed and banks. Unless material is supplied quickly enough from the catchment, the upstream bed will erode. As soon as the level of the bed is lowered, bank erosion will occur and the effect of this erosion can be transmitted for considerable distances upstream. Furthermore, when a riverbed is lowered, the channel can carry more water than when the river is flowing bank full. The resulting increased energy will make bank erosion downstream more likely. Eventually a reasonable equilibrium may be re-established with the bed once again at its equilibrium grade but the river channel may have changed significantly by that time. In the absence of a sufficient supply of gravel from the catchment, equilibrium is likely to be re-established through increased bank erosion due to increased flow velocities.

In the Bay of Plenty there is a major division between sedimentary (greywacke) and volcanic (mainly ignimbrites) lithologies (Figure 1.1). This results in significantly different gravel regimes between the western and eastern parts of the region. Catchments in greywacke characteristically have steep slopes and erosion is predominantly debris avalanches, which supply relatively large sized rock material into watercourses. However, the structural characteristics of greywacke (its jointing and, where it was in the vicinity of a fault line, its crush fractures) means that the debris is easily broken into smaller material by water action. Thus rivers draining greywacke usually have rock or shingle beds and carry a significant bedload of shingle, sand and silt.

Catchments with volcanic lithologies exhibit a different erosion pattern. Although these catchments also often have very steep slopes next to watercourses, these slopes are relatively stable. Where erosion does occur, it is usually surface erosion of the overlying volcanic ashes, which, by their nature, supply predominantly sand sized material to the watercourses. Thus rivers draining volcanic lithologies usually have sand beds and their bedload consists of sand.

Human use of land and rivers has changed both the rates and the significance of many river processes. For example, changes to erosion rates can be caused by an alteration (usually a decrease) in the vegetation within a catchment. The reduction of vegetative cover in a river catchment often results from land clearance for pasture development and from animal grazing or trampling. Animal pests also decrease the health of the protective bush cover including its undergrowth. In addition, the presence of grazing animals may slow or prevent the revegetation of erosion scars.

Changes in the significance of river processes can be caused by developments alongside rivers, riverbed channelisation and by increasing the use of the water for domestic or irrigation purposes. Rivers normally move about in their valleys by a process of erosion and deposition. This natural process becomes significant when it

adversely impacts on humans. The location of settlements and infrastructural investments close to river channels mean that changes in river courses, whether natural or human induced, become a concern. The maintenance of a stable pattern that preserves aquatic habitat and human values is an important requirement. Vegetative cover within river channels may become depleted through a cycle of stock grazing and what may be termed "creeping bank erosion". During flood events such sites are particularly vulnerable to large-scale bank erosion. Frequently the result is a significant loss of the remaining vegetation and adjacent land. This is a particular problem in the middle reaches of several of the region's major rivers.

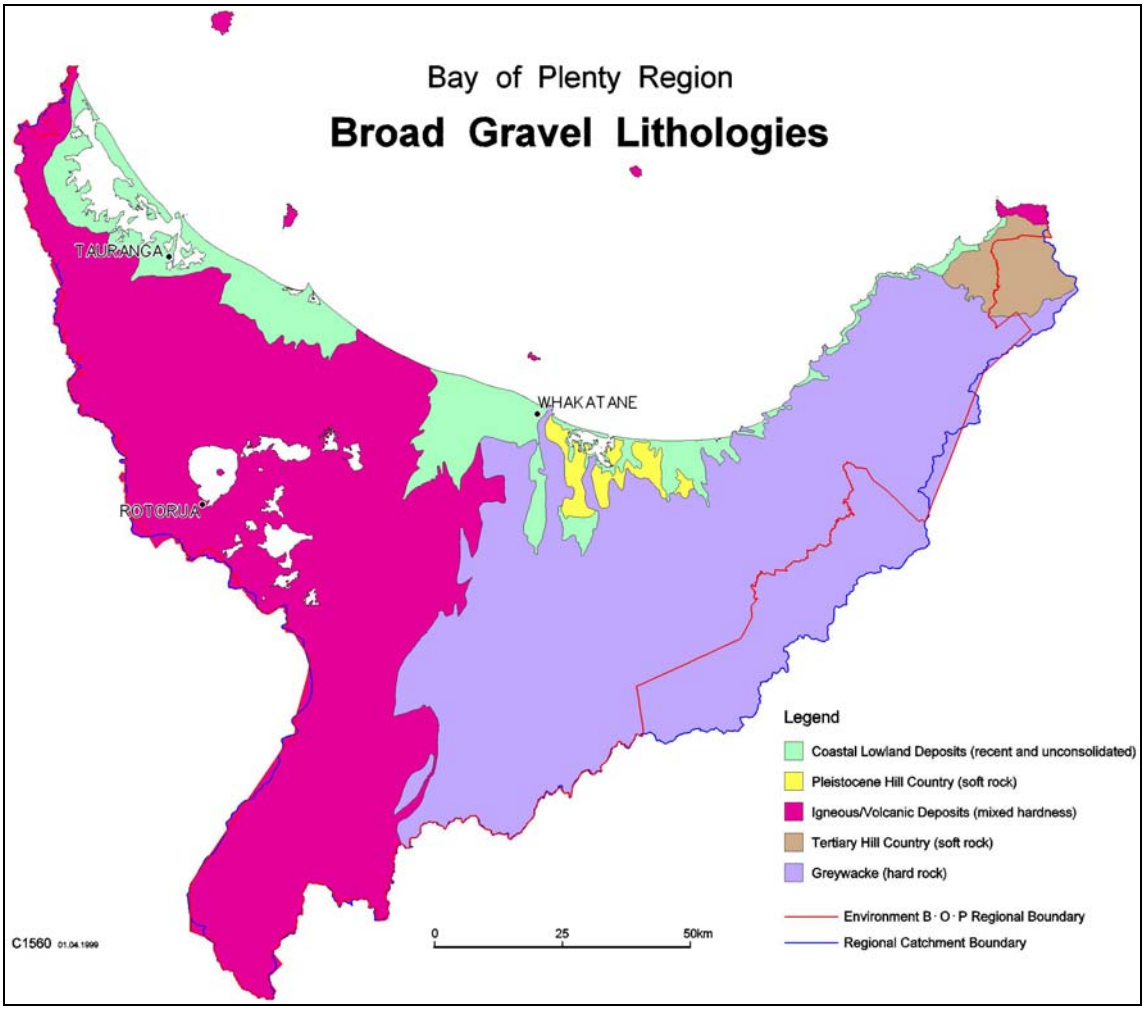


Figure 1.1 Broad Gravel Lithologies

2.2 Coastal Supply

Rivers supply significant volumes of sand and silt to the coast and these materials are important elements of the cycles of coastal erosion and deposition. Gravel excavation can affect the natural supply of river gravel to coastal beaches and a decrease in the supply of gravel may cause increased vulnerability of coastal erosion. The dynamics of particular coastal systems such as the existence of long shore drifts, mean that the effects of such interference may not necessarily show in the local environs.

Coastal dynamics are typically very complex and therefore take time to identify. This means that excavation levels established now may need to be reviewed in the light of future findings.

Flood control works on rivers such as stopbanking, prevent the normal deposition of gravel and the smaller-sized sands and silts. In this situation, gravel which in a natural river system would have been deposited over flood plains, may now be channelled down to the coast and into estuarine environments. This can have a beneficial effect providing a supply of sand to beaches and thus reducing coastal erosion. In the Bay of Plenty the combined impacts of gravel management and flood control works on the coastal environment seem to be positive. For example, around 2 million cubic metres of sand and silt was transported through the Whakatane River mouth during the floods of July 1998. As postulated in the thesis by Saunders (1999), much of this has been transported to Ohope Beach. Without the stopbanking systems much of this material would have been deposited prior to reaching the sea.

2.3 The Extent of Gravel Excavation in the Bay of Plenty

Environment Bay of Plenty currently consents gravel excavation from approximately 60 sites, although not all are worked at any one time. Figure 1.2 indicates the consented gravel excavation sites for the years up to 1999. The sites are in the eastern Bay of Plenty from Rangitaiki to the Raukokore Rivers, and are basically those draining the greywacke ranges. Sites are selected and worked on the basis of the need for the material to be removed and on gravel demand. Environment Bay of Plenty does not excavate any gravel itself, but permits commercial operators and district councils to do so.

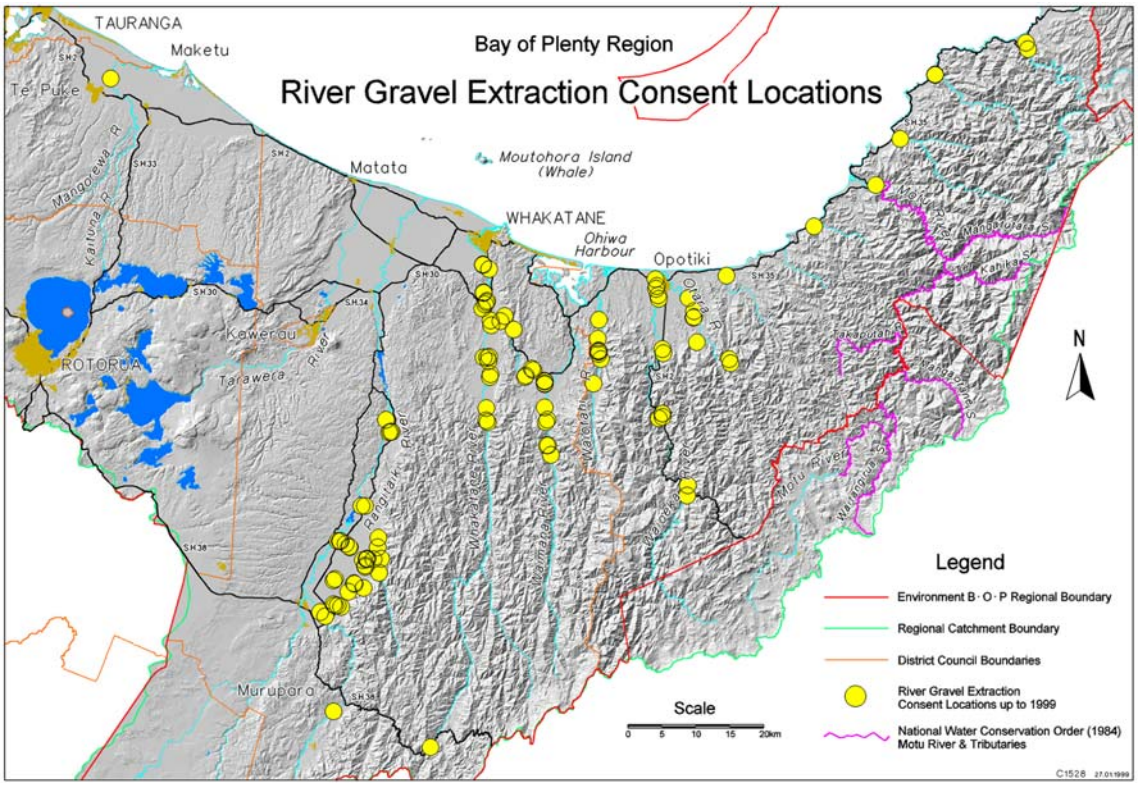


Figure 1.2 Consented Gravel Extraction Sites for the years up to 1999

2.4 The Reasons for Gravel Excavation

In the Bay of Plenty, gravel is excavated from rivers for two primary reasons:

(i) River management; and

(ii) Commercial use.

2.4.1 River Management

The majority of river management problems in the Bay of Plenty result from aggradation of the riverbed and/or erosion of the riverbanks. The major economic problems caused by riverbed aggradation and erosion are generally restricted to the flood plains of the major river systems in the eastern Bay of Plenty.

Aggradation occurs when the supply of gravel to a river exceeds the quantity of gravel being lost from it. While bed aggradation may be localised within some reaches of a river, it tends to cause instability and erosion over extended lengths of the bed and especially on river flood plains.

Any option for managing aggrading rivers must address one or more of the following aspects:

- reducing gravel supply to the river;
- relocating gravel from aggrading reaches to those parts of the river that are eroding or degrading;

- controlling river location, flood flows and bank or bed erosion through the use of flood banks, protection structures and vegetative buffers;

- increasing gravel transport through the river;

- removing gravel directly from the river system.

Although Environment Bay of Plenty uses a combination of these methods to manage the region's rivers, gravel excavation is considered to be the most effective method, providing the greatest benefits for the least cost.

Many lower reaches of rivers are stopbanked. These are not only investments in themselves, but also protect other assets such as energy and transport routes, farms, houses and settlements. The integrity of these stopbanks depends on the river channel changes being controlled within a confined route. In addition, structures over rivers, such as bridges, may be threatened by both bank erosion (weakening the bridge abutments) and by build-up of the bed (reducing the waterway area beneath bridges). Both effects cause potential threats to these structures during floods.

Climatic cycles may also cause significant changes to the dynamics of a river. For example, a period of bad weather (i.e. a cyclone or storm) and/or increased rainfall may accelerate the rate of erosion and deposition in both the river catchment and the river itself. These periods of bad weather may last for several years and in between these periods there may be years or even decades where erosion and deposition will be comparatively slight. Major storms can also cause significant problems up to several years later.

Both these cycles and changes in river morphology (including its route and meander pattern) whether through natural processes, accelerated processes brought about by changes in its catchment, or through highly modified channelisation and straightening, are important. On some rivers, it is critical that the course of a river is maintained to protect private property and other valuable assets. However, another equally important reason for river maintenance is to reduce the effects of channelisation and infilling of estuaries. As an example, land titles have been surveyed and defined whilst a river is in a certain location, and there is a desire to hold the river at that location in perpetuity. Although the degree to which rivers need to be managed can be debated, if there was not an adequate level of river management or maintenance occurring on some rivers, flood control systems would gradually lose effectiveness and break down. As a result, a number of necessary assets would be lost and it would be extremely costly to replace them. More importantly, significant flood risks would arise on the neighbouring flood plains which are not frequently settled or farmed.

Although rivers are managed by a variety of means, removal of excess gravel is considered to be an effective method. Where possible, Environment Bay of Plenty uses the commercial demand for gravel as a means of excavating the gravel it needs removed for river management purposes. It does this by directing firms that want gravel to specific sites. However, if there is insufficient commercial demand for excess gravel because of quality or access, Environment Bay of Plenty may need to excavate gravel itself at a cost to the river scheme or to the region.

2.4.2 Commercial Use

Shingle and sand components of gravel have a commercial value and rivers are an important source of industrial aggregate for construction and roading purposes. For these reasons, gravel is excavated by aggregate supply firms, district councils for

their own roading use and large landholding firms such as forestry companies, also for their own use. In addition, farmers excavate relatively small quantities of gravel for their own use. However it is important to note that gravel excavation operations tend to excavate material at places and at times that are governed by access, demand and economics. Therefore, gravel excavation tends to be undertaken at sites close to markets and where access is convenient. Quality of the gravel also plays an important role and excavators prefer the best quality gravel available. Consequently, this can lead to excessive excavation at particular sites rather than a more even excavation along a river or at sites that are actively aggrading. This aspect is now carefully controlled in the Bay of Plenty to ensure that excavation is within desirable limits.

2.5 The Statutory and Administrative Framework for Gravel Management in the Bay of Plenty

The Resource Management Act, 1991 (RMA) is the principal statute governing the management of the environmental effects of gravel excavation. In accordance with the RMA, there has been a range of planning documents prepared to manage gravel in the Bay of Plenty. The RMA establishes a hierarchy whereby regional plans must not be inconsistent with the Regional Policy Statement, which in turn cannot be inconsistent with any national policy statements. Similarly, District plans cannot be inconsistent with any national policy statements, Regional Policy Statement or any regional plan (for matters of regional significance or matters which the regional council has primary responsibility).

Environment Bay of Plenty also undertakes flood control works under the SCRCA and the Crown Minerals Act, 1991 (CMA) governs the excavation of gravel from any Crown owned riverbeds. Section 126(2) of the SCRCA allows Environment Bay of Plenty to excavate gravel for the purpose of controlling the flow of water, and lessen overflows and erosion of riverbanks. The major river control schemes in the Bay of Plenty were established under this section of the SCRCA, and gravel is excavated as one means of maintaining them.

Other individuals and organisations that have responsibilities for river gravel management in the Bay of Plenty include, but are not limited to:

- **Individuals –** Section 17(1) of the RMA gives individuals a general duty of care to control the effects of the gravel excavation activities they undertake. For example, individuals are required to ensure that sites for vehicle crossings minimise disturbance to fish spawning, and that operations are carried out so as to minimise silt entering water.

- **Tangata Whenua –** The Treaty of Waitangi, as acknowledged by the RMA gives tangata whenua a significant role in resource management, exercised through kaitiakitanga. For Maori, land, air and water are ‘taonga tukuiho’ of special significance. The tangata whenua, through their iwi, hapu, or sometimes whanau, are the traditional kaitiaki of these taonga.

  Maori environmental resource management is based on the integrity and restoration of the mauri of natural resources. It relies on traditional as well as modern knowledge systems, hui and collective implementation by the community beginning at the marae level.

The RMA identifies the relationship of Maori and their culture and traditions with their ancestral lands and water as being a matter of national importance (section 6(e)). In this instance "ancestral" means something which has been owned by ancestors, although not necessarily still in Maori ownership.

The ownership of land, including riverbeds is sometimes unclear. The issue concerns aboriginal title claimed by tangata whenua and crown title obtained under various statutes. In some instances iwi have lodged claims to the Waitangi Tribunal in relation to the ownership of riverbeds and this is a matter for the Crown to resolve.

- **District Councils –** District councils are responsible for controlling activities on the surface of rivers. District councils also have responsibility for controlling the effects of activities taking place on land which may be associated with gravel excavation such as processing. These effects include for example, those relating to transport, noise, heritage (cultural and natural), dust, visual (landscape), amenity values, recreation and public access.

  The principal district responsibilities that may be relevant to gravel excavation are:

  - Activities on the Surface of Rivers

    Activities, such as jet-boating can impact on gravel excavation, or be impacted by gravel excavation. Excavations, river diversions, vehicle crossings, or the creation of wide shallow water channels are activities, which can arise from gravel excavation and which can adversely affect activities on the surface of rivers.

  - Public Access Along Rivers

    The provision of access along rivers is a matter of national importance and is a responsibility that applies equally to both Environment Bay of Plenty and district councils. However, district councils, as the local authority that controls the effects of the use of land are better able to provide for public access. This is emphasised in the Bay of Plenty Regional Policy Statement (method of implementation 8.3.3(c)(xiv)) which encourages district councils to establish programmes to formally protect access to and along the margins of lakes and rivers. Through their planning process, district councils should also be involved in making provision for areas for gravel stockpiles and processing.

  - Noise

    Although Part I of the Second Schedule to the Resource Management Act 1991 allows a regional plan to make provision for the emission of noise arising from gravel excavation, district councils are primarily responsible for the control of the emission of noise and the mitigation of the effects of noise. Noise can arise not just from the excavation operation itself but also from associated activities such as depots, processing sites and truck movements.

  - Infrastructure and Utility Requirements

    District councils are responsible for providing and maintaining several (but not all) structures such as bridges and utilities (for example pipelines) across and along rivers. Although some river management,

including gravel excavation, is undertaken to protect these assets, too much, too little, or inappropriate excavation can damage them.

District councils control of the subdivision of land adjacent to rivers and inappropriate subdivision can also affect the future ability to provide machinery access for the construction and/or maintenance of flood protection works and gravel excavation activities.

- **Ministry of Commerce –** Where gravel is in riverbeds owned by the Crown it is a Crown-owned mineral. However, where there is private title to the riverbed, gravel may still be Crown-owned depending on when the land title was created. Excavation rights to Crown-owned minerals are governed by the Crown Minerals Act 1991, which is administered by the Ministry of Commerce.

  The presumption of the Crown Minerals Act 1991 is that no person may prospect or explore for, or mine Crown owned minerals unless they hold a permit (s. 8(1)). However, in the case of natural materials in the beds of rivers, lakes or the coastal marine area, there are no restrictions within the Crown Minerals Act unless otherwise specified in a minerals programme. Under the Act, the Ministry is responsible for developing Crown Minerals Programmes, which are to allocate rights to Crown-owned minerals and to set a system so that the Crown can obtain a "fair financial return" (s.12).

  No minerals programmes have yet been drawn up, although shingle is to be the subject of such a programme. It is not known at the time of writing whether the Ministry intends to delegate to regional councils the function of controlling shingle management in rivers, and if so, whether the Crown will require a royalty. However, even if a Crown Minerals Programme was prepared for shingle, the environmental effects of shingle mining will continue to be controlled through the Resource Management Act 1991 and the Operative Regional River Gravel Management Plan for the Bay of Plenty Region.

- **Department of Survey and Land Information –** The Department of Survey and Land Information administers the Land Act 1948 and Environment Bay of Plenty holds two Blanket Licences issued under section 165 of this Act. These licences authorise Environment Bay of Plenty to control the excavation of material from Crown-owned riverbeds administered by the Department of Survey and Land Information. The licences exclude areas within the Tauranga Harbour Limits (including the Wairoa River) and those sections of rivers flowing through scenic reserves and Te Urewera National Park. Section 165 of the Land Act and thus the Blanket Licences are subservient to the Resource Management Act, 1991.

  The authority given to Environment Bay of Plenty by the Blanket Licences appears to overlap the provisions of the Crown Minerals Act. However, the Blanket Licences are the Crown's authorisation as owner of the land, whilst the Crown Minerals Act covers the Crown's interest in the minerals.

- **Department of Conservation –** The Department of Conservation (DoC) has responsibilities under section 6 (a) and (b) of the Conservation Act 1986 and the Fish Passage regulations that are of relevance to gravel excavation responsibilities. These sections require DoC to preserve as far as practicable all indigenous freshwater fisheries, and to protect recreational fisheries and freshwater fish habitats. Also of relevance to gravel excavation is DoC's responsibilities for the management of marginal strips, as set aside under section 24 of the Conservation Act. The Act establishes the purposes of these

strips as including the maintenance of adjacent watercourses and water quality, the maintenance of aquatic life, protection of natural values and enabling public access and recreational use. The Act also advocates the protection of natural and historical resources.

- **Eastern Region Fish and Game Council –** Fish and Game are responsible for managing and enhancing sport fish and game bird resources and for looking after the recreational interests of anglers and hunters. These responsibilities are relevant to gravel excavation because gravel excavation can adversely affect trout habitat (particularly food supply and spawning sites) as well as the pleasantness of angling.

- **New Zealand Historic Places Trust –** The New Zealand Historic Places Trust (NZHPT) has a statutory obligation under the Historic Places Act 1993 to identify, classify, and protect historic places. Historic places include natural objects as well as archaeological and traditional sites that have cultural, traditional, aesthetic, or other values of the past. It is illegal for anyone to destroy, damage, or modify any archaeological site without prior authority from the trust. Rivers were the foci of many historic settlements and transport routes. Therefore, rivers are likely to have historic places in their vicinities, which may be at risk from gravel excavation or associated activities such as building access roads.

Chapter 3: Gravel Management

3.1 Data Collection and Methods used to Monitor Gravel Excavation

The RMA and prudent river management require an understanding of both the movement of gravel down rivers and the effects of gravel excavation. In order to do this, Environment Bay of Plenty employs a number of different methods. These include cross-section measurement and analysis operators' records of gravel excavation, aerial photography and benchmark locating.

3.1.1 Cross-sections

Cross-sections are the primarily means of monitoring gravel dynamics in the Bay of Plenty. Environment Bay of Plenty has established a comprehensive system of cross-sections and these are surveyed regularly. The results of these surveys are checked against gravel excavation records to develop an understanding of the movement and management of gravel in the river systems of the Bay of Plenty region.

The cross-section survey programme is shown in Table 3.1. This survey programme varies to meet the need to survey the cross-sections after significant freshes in a river system. For example the rivers most affected by the major floods in July 1998 were resurveyed ahead of the programmed date.

Table 3.1 Cross-section Survey Programme as at July 2002

River Name	No. of Cross Sections	Cross Section Spacing	Suggested Frequency of Survey	Relative Extraction Pressure
Otara	37	300-800 m	2-5 year	Low
Waioeka	20	300-800 m	2-5 year	Med
Waimana *	35	400-1200 m	1-2 year	Med
Whakatane (below Pekatahi Bridge)	35	300-750 m	2-5 year	Med
Whakatane* (above Pekatahi Bridge)	34	500 - 1200 m	1-2 year	Med
Rangitaiki (Lower)	67	300 - 700 m	3-5 year	Low
Rangitaiki (Waiohau)	12	900-1200 m	5 year	Low
Rangitaiki (above Aniwhenua)	28	800-1300 m	5 year	High
Whirinaki *	7	500-1000 m	1-2 year	Med
Tarawera	18	700-1500 m	5 year	Low
Ohutu *	6	400-600 m	1-2 year	Med
Mangamate *	7	350 - 550 m	1-2 year	Med

River Name	No. of Cross Sections	Cross Section Spacing	Suggested Frequency of Survey	Relative Extraction Pressure
Ruarepuae *	7	100 m	1-2 year	Med
Horomanga *	14	300 - 800 m	1-2 year	Med
Kopuriki *	3	250 m	1-2 year	Med
Kaituna (below Te Matai)	26	500 - 600 m	3-5 year	Low
Kaituna (above Te Matai)	17	400 - 800 m	3-5 year	Low
Mangorewa	3	500 m	3-5 year	Low
Waiotahi	7			Med
Waikokopu *			2 year	Med

* *More frequent surveys may be appropriate to match excavation activities.*

There is no uniform approach to the spacing of cross-sections; on some rivers they are 100 metres apart while on others they are 1 kilometre apart. Environment Bay of Plenty needs to assess what distance is appropriate to effectively monitor each river system. In general this will depend on the size of the river. The non-uniformity of the cross-sections is not a problem in itself, rather monitoring requirements should be tailored to the level of detail and accuracy of monitoring required for each river. For long-term monitoring, it is more important to compare new data with as long a record as possible, so that long term trends are identified and existing sites are able to be maintained.

3.1.2 Gravel Excavation Records

Appendix I details the gravel that has been excavated in the Bay of Plenty region from July 2000 to June 2001 as an example of how much gravel is being excavated from the region's rivers on a yearly basis.

Currently, operators' records show gravel volumes after it has been screened and processed or sold. For river management purposes and for determining the amount of material available for excavation, the relevant measure is the total quantity removed from the river, not just the commercial components of the gravel removed.

Reliable estimates of the gravel yield can be derived from these records and from using the information from the cross-section surveys or other more appropriate survey methods.

The quantity of gravel transported by the river can be derived from "gravel balance" calculations as the difference between net change in river storage, (estimated from inter-survey bed level differences), and gravel excavated (estimated from gravel excavation declaration returns over the period between cross-section surveys).

3.1.3 Aerial Photography

Aerial photography is regularly undertaken on river systems throughout the Bay of Plenty and this enables visual evaluations of gravel accumulations to be made. Aerial photography enables Environment Bay of Plenty to identify and direct gravel excavation to these areas.

3.1.4 LIDAR

Environment Bay of Plenty have recently commissioned a trial LIDAR survey of the Otara, Waioeka, Waimana and Whakatane Rivers. This is to determine a three-dimensional model of these riverbeds. The survey will be repeated in around 3 to 5

years time and will improve the precision of assessing the gravel dynamics. This method is however costly.

3.2 Excavation Levels

In a managed river system both over-excavation and under-excavation can cause undesirable effects. Under-excavation is likely to result in aggradation of the riverbed which decreases the ability of the river channel to carry floods. This results in greater erosion pressure on riverbanks, increased flooding of productive land and the infilling of the beds of any dams. In severe cases the loss of land and the associated assets of stopbanks, bridges and other utilities such as roads and pipelines can be substantial.

Disequilibrium resulting from over-excavation can cause bed erosion and degradation of the upstream bed which in turn may lead to bridge piers and abutments being undermined. Controlling these effects and protecting the river, stop banks and other structures may require expensive erosion control works.

To ensure that gravel excavation activities are managed in an environmentally sustainable manner, and that any adverse effects are avoided where possible or otherwise minimised, gravel excavation rates need to be set between the following two levels:

- **The minimum excavation level (if any)** required to be removed for river management purposes. Basically this is less than or equal to the new quantity of gravel being supplied naturally from the river catchment, except where the riverbed is already too high (i.e. Otara, Horomanga) or too low (i.e. middle reaches of Whakatane River). In these cases excavation rates should respectively exceed or fall below natural rates. Achieving the minimum excavation level requires specifying the quantity, rate and depth of removal at the specific river reaches that need gravel excavated;

- **The maximum amount (if any)** that can be removed before any adverse effects become unacceptable. This amount also needs to specify the quantity, rate and depth of excavation for each specific beach location. The maximum amount can be zero when gravel supply is less than natural loss to the river system. This amount can temporarily exceed the annual new supply level when previous under-excavation has resulted in bed aggradation and gravel build up.

The amount of gravel required to be excavated from a particular river reach for river management purposes, or the maximum amount available for commercial excavation, depends on the amount being transported by the river and deposited in that reach. In some years no gravel at all will be deposited in a particular reach, while in others there may be a significant amount. Gravel transport is to a large degree episodic, with significant proportions transported in the major floods. Specific site excavation rates may need to be reviewed after significant flood events.

The effective regulation and monitoring of gravel excavation activities through the systematic collection of measurements of the trends in bed levels, gravel deposition and excavation rate data over time is essential for setting maximum and minimum excavation rates.

The reasons for encouraging or limiting excavation to stabilise river systems are illustrated by the figures on the following two pages. These show that:

- If the bed level is too high or the waterway congested, flooding is more likely.
- If the bed level is too low, banks are high and have to take the full force of the flow during a flood. Consequently, protection works may be undermined; and more gravel is transported downstream to build up elsewhere. Bank protection works are more costly.

Work needs to be done to define desirable bed levels around the region, for protection of assets of each river scheme and of the public in general.

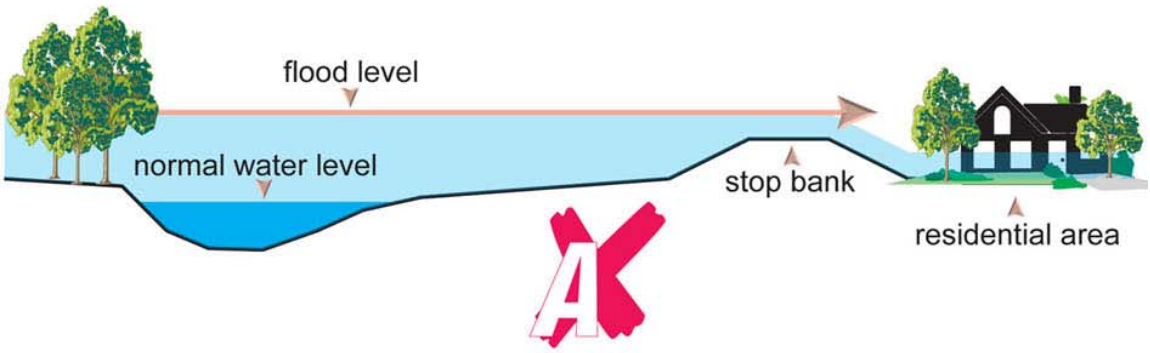
To encourage stable channels, the following factors need to be promoted:

- Maintaining bed levels and grades within a desirable range.
- Maintaining good river alignments.
- Keeping gravel extraction roughly in balance with natural supply rates.
- Compatibility with existing flood protection structures and utility assets.

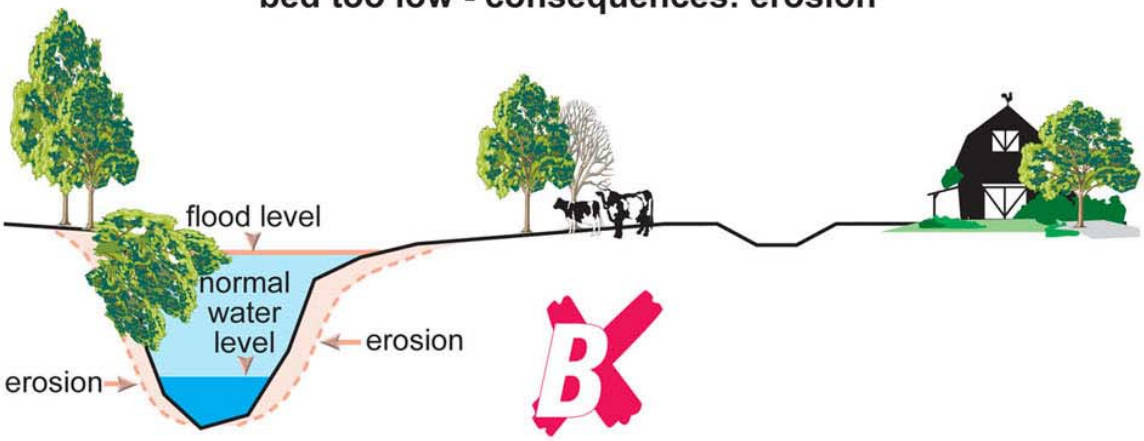
Gravel Extraction Strategy

Optimum Bed Levels

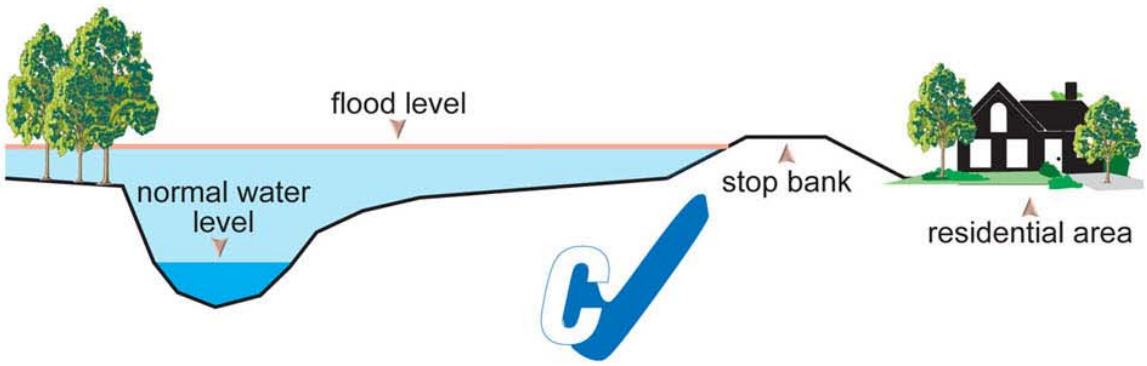
bed too high - consequences: flooding



bed too low - consequences: erosion

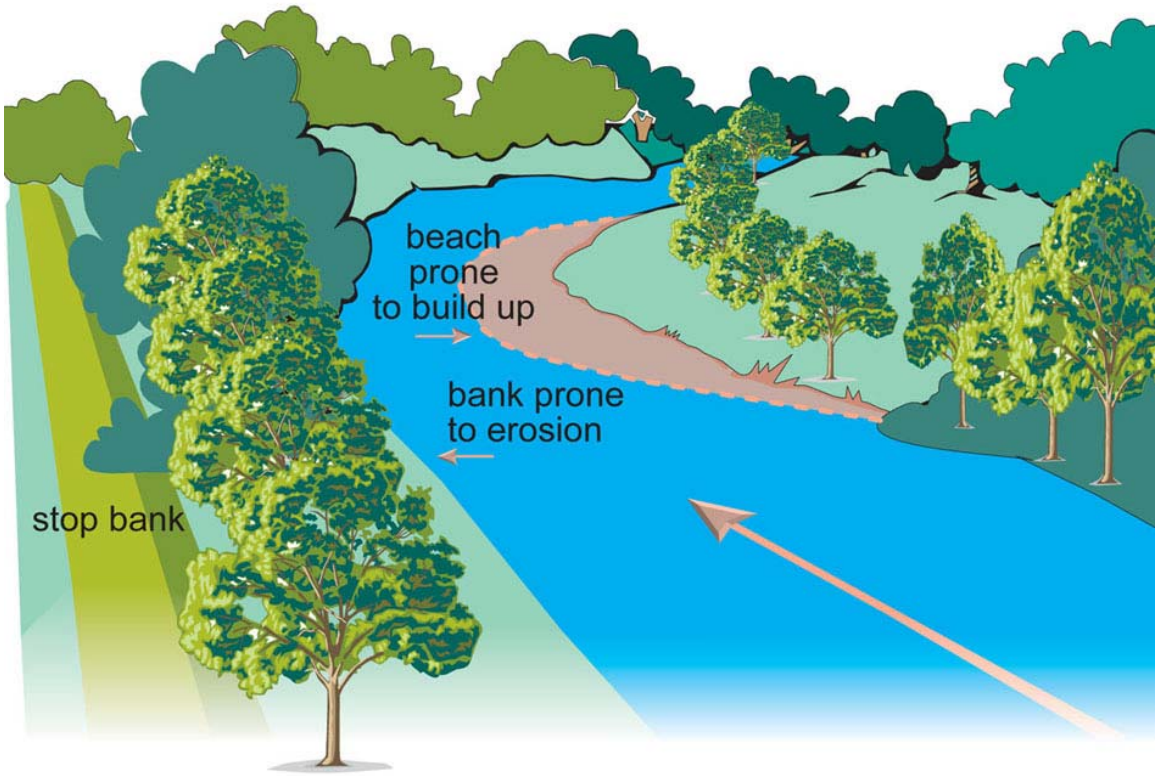


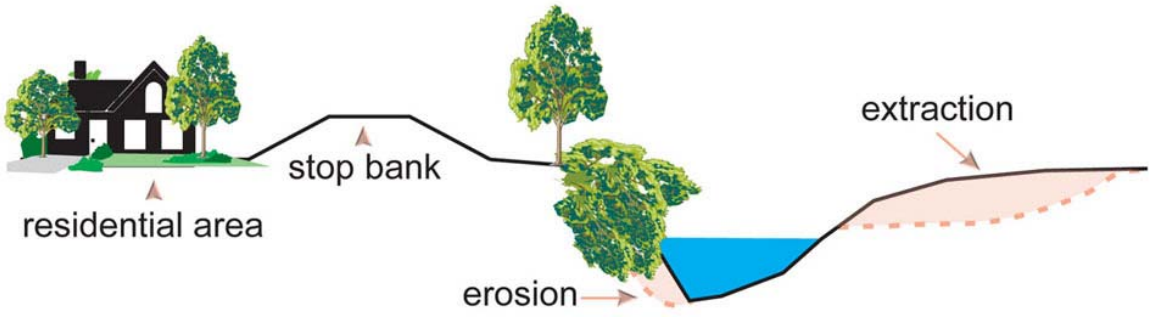
optimum level - consequences: risks kept within reasonable limits



Gravel Extraction Strategy

Remedying Erosion Risk at Bends





3.3 Current Excavation Levels

Environment Bay of Plenty is able to make a comparison between the quantities of gravel excavated, natural supply and removal based on data collected on the various rivers. Each year, Environment Bay of Plenty produces Natural Environment Regional Monitoring Network (NERMN) Reports on the River and Stream Monitoring Programme. Among other things, these reports provide a detailed analysis of the river/stream systems in the Bay of Plenty at that time.

It is important to recognise that the floods in July 1998 caused significant changes to gravel volumes and these changes are likely to affect the management of gravel for several years. The analysis has been more complex than in the past because of the need to separate out changes in gravel volumes from deposition of silt. For the wider rivers with obvious floodplains, this has been done by defining the limits of the main channel (the "design channel"). Material within these limits is assumed to be predominantly gravel, while material outside it is assumed to be silt or sand.

During the 1998 floods, an estimated 1,900,000m^3 (net) of sediment was deposited on the floodplains of the Whakatane-Waimana and Waioeka-Otara schemes. The majority of this was sand and silt sized particles. The surveys taken between the years of 1999 and 2000 show that there has actually been a loss of this sediment in the Whakatane-Waimana scheme, and to a lesser extent in the Waioeka floodplain, whilst the Otara River sees continuing deposition on its floodplains due to settlement of the silt.

Appendix 2 shows estimates of average gravel supply rates and short and medium term (3 and 10 year) excavation rates for many of the Bay of Plenty Rivers as at 2000. However, it is important to note that gravel supply can vary greatly from year to year.

As an example of current excavation levels for a key river in the Bay of Plenty Region, the situation of the Whakatane River as at February 2002 is examined in Appendix 3.

Chapter 4: Principles to Avoid, Remedy or Mitigate Adverse Environmental Effects of Gravel Excavation on Riverbeds and Water

4.1 General

The principles set out below provide general guidance on matters that should be considered when carrying out gravel excavation in order to avoid, remedy, or mitigate any adverse environmental effects.

All persons carrying out gravel excavation activities need to be thoroughly familiar with the following principles, as well as the more specific operational guidelines identified in Chapter 5 and any resource consent conditions. Their knowledge and understanding of the principles will be a major factor influencing the environmental effects of any work carried out.

4.2 Principles

4.2.1 Maintain Appropriate Bed Levels and Bank Stability

All gravel excavation activities need to be planned and undertaken with the primary objective of improving river flood flow capacity while maintaining appropriate bed grades and bank stability (and not causing erosion or instability). To achieve this it is strongly recommended that approval and advice is obtained from the works engineer at Environment Bay of Plenty.

4.2.2 Minimise Instream Works

In order to limit degradation to water quality it is important to keep machinery out of water unless necessary for critical works or access to the work site. Avoid instream works during fish spawning and migration periods.

4.2.3 Avoid the Discharge of Contaminants onto Riverbeds or into the River

Avoid oil and fuel discharges, spillage, and spray drift onto riverbeds or into the river. Refuelling activities and fuel storage should not occur on the riverbed or within 20 metres of the flowing water's edge or anywhere else where spillage of these contaminants may enter into water. Machinery should be regularly maintained so that leakage from hoses and pipes are unlikely and spray and fuel containers should be disposed of safely off-site.

4.2.4 Avoid the Discharge of Sediment into Water

When carrying out gravel excavation on river banks or dry riverbeds, plan and implement the works so that the discharge of sediment into the river channel is avoided as far as practicable. Maintain a set distance (depending on the site limitations) between the works site and stream flow, so that the likelihood of accidental discharges is minimised. Placement of rock or structures on river banks or beds should be undertaken in a manner that minimises the discharge of sediment into water.

4.2.5 Isolate the Works Site to Avoid Adverse Off-Site Effects

Use diversion bunds to direct clean stormwater runoff safely away from the works site if possible. Manage the site so that stormwater runoff from the disturbed area is handled separately from runoff above the site. Use natural vegetation or sediment control devices to filter or treat any stormwater runoff if possible, prior to discharging it off-site (Refer to 'Erosion and Sediment Control Guidelines', Environment Bay of Plenty).

4.2.6 Avoid or Mitigate Effects of Gravel Excavation on Fish Passage

Gravel excavation should not impede fish passage following completion of the works. If the activity is likely to result in a barrier to fish passage, then some form of mitigation should be provided.

4.2.7 Avoid or Mitigate Effects of Gravel Excavation on Bird Nesting

Gravel excavation activities should not occur during bird nesting seasons where habitats have been identified. Works should not commence in these areas until nesting and/or rearing is complete.

4.2.8 Maintain Ecological Values

Plan and implement works so that ecological values are avoided, remedied or mitigated. Consider the protection of wetlands, riparian margins, aquatic and terrestrial habitats as part of the works programme.

4.2.9 Avoid Archaeological or Historic Sites

Adequate planning and consultation should be undertaken to ensure that archaeological and/or waahi tapu sites are avoided. If an unknown archaeological or historic feature is disturbed, work should cease immediately until authorisation from the Historic Places Trust has been granted.

4.2.10 Consider Emergency Contingencies

In case of flood or other emergencies while works are still underway, consider matters such as access to and from the site, notification of appropriate personnel, security of vehicles, gear and equipment, etc.

4.2.11 Critically Assess your Operational Methodology

Always use the correct type of machinery to carry out the operation effectively, efficiently, and with minimal environmental impact. Timing of operations should take into account such matters as the nesting season for native birds, and spawning and migration seasons of fish. Also consider the most appropriate time of the year to carry out work (winter earthworks may be unsuitable). Check the weather forecast

daily, and alter your work programme accordingly if necessary. At the end of each day's work, leave the site with any necessary runoff controls in place, and machinery/equipment well clear of waterways.

Chapter 5: Operational Guidelines for Gravel Excavation

The following guidelines set out the requirements for undertaking gravel excavation. However, meeting these requirements does not absolve persons undertaking gravel excavation from any common law liabilities.

5.1 Before Commencing Gravel Excavation

5.1.1 Preliminary Considerations:

Before commencing any gravel excavation activities, any person wishing to undertake gravel excavation will need to have the appropriate authorisation and consider the following aspects:

(a) Whether the gravel excavation is a permitted activity under Rule 1 of the Regional River Gravel Management Plan (i.e. involves the removal of less than 100 cubic metres, See Appendix 4). If so, the operator must make themselves familiar with, and comply with the permitted activity conditions.

(b) Whether the gravel excavation activity is a permitted activity under Rule 2 of the Regional River Gravel Management Plan (i.e. involves the removal of between 100 and either 1,000 or 2,500 cubic metres depending on river width, See Appendix 4). If so, the activity must be authorised by Environment Bay of Plenty and the works engineer must be contacted for details. The operator must make themselves familiar with, and comply with the permitted activity conditions of Rule 2.

(c) If the gravel excavation activity is not permitted under Rule 1 or 2 of the River Gravel Management Plan (See Appendix 4), they will need to obtain a land use consent from Environment Bay of Plenty. Operators must be familiar with the conditions that have to be met in order to comply with the consent requirements.

Note: Failure to comply with the conditions specified in either the permitted activity rules or the resource consent can render the excavator liable for prosecution.

(d) Whether a land use consent will be required from the relevant territorial authority pursuant to Section 9 of the Resource Management Act 1991 (see the relevant district plan).

(e) Whether approval has been obtained from the owner of the gravel.

(f) Whether permission has been given by relevant landowners for both access to the site and gravel transportation.

5.1.2 Notification in writing is required to be made to the Group Manager, Regulation & Resource Management (Environment Bay of Plenty) at least five working days prior to the commencement of each period of works. This notification should include a statement containing the location of the site from where the gravel is to be excavated, the quantity of gravel to be excavated and the dates when the excavation activity is to be undertaken.

5.1.3 Regional Council staff will need to inspect the prospective area of work at least three working days before gravel excavation begins. This is to ensure that the excavation activities will not cause adverse effects on the banks or bed of the river, or unduly disturb any areas of significant flora, fauna or habitat.

5.1.4 Where the activity poses, or is likely to pose a risk to the public, the contractor shall erect warning signs adjacent to the site where excavation will take place. These signs shall be removed on completion of the operation or when the activities on the site are no longer a danger to the public.

5.1.5 Where suitable vehicle and/or equipment access is not available, access tracks shall be located on the dry parts of the riverbed and should be sited so as to avoid earthworks or vegetation removal. If major earthworks or vegetation disturbance is unavoidable, a land use consent may be required.

5.1.6 Appropriate erosion and sediment controls shall be installed on access tracks to prevent sediment contaminated stormwater from entering the stream/river channel (Refer to *'Erosion and Sediment Control Guidelines'*, Environment Bay of Plenty).

5.2 During Gravel Excavation

5.2.1 Permitted Activities

(a) Gravel shall only be excavated from the dry parts of the gravel beach that are more than 0.3 metres above the level of the adjacent river at the time of gravel excavation.

Note*:* Any excavation of gravel from the flowing channel or from areas which are less than 0.3 metres above the adjacent river level will require resource consent.

(b) The operator shall avoid machinery entering water unless it is necessary for access to the work site.

(c) Temporary stockpiles shall be kept to a practicable minimum size to avoid or minimise any obstruction or diversion of flood flows. In particular, stockpiles shall be orientated parallel to water flows.

(d) Stockpiles shall be at least 20 metres from the flowing water's edge and located on sites at least 0.3 metres above the level of the adjacent river.

(e) Gravel excavation shall not cause damage to any riverbanks, protection works, access or any other works relating to the control of the river.

(f) Stream crossing by machinery or trucks shall be avoided. When alternative access is not available, operators are required to notify the Department of

Conservation and Fish and Game New Zealand before any vehicles or equipment cross the stream. Stream crossings or travel along the wet parts of the bed can then occur provided that these do not take place during the trout spawning and hatching season of **1 May** to **31 October** or during low flow conditions. Stream crossings should also be limited to a maximum of five consecutive days during the whitebait migration season from **15 August** to **30 November** in any year.

(g) Gravel excavation activities shall not impede public access to and along the river except for temporary restrictions necessitated by operational health and safety requirements.

(h) The operator shall avoid operations during bird nesting seasons where habitats have been identified. Works shall not commence in these areas until nesting and/or rearing is complete.

(i) Gravel excavation activities shall cease immediately, should any archaeological or historic site be discovered as a result of the activity. Excavation activities can only resume once appropriate authorisation is received. The operator shall advise both the local office of the Historic Places Trust and the Group Manager Regulation & Resource Management (Bay of Plenty Regional Council) or their delegate when any archaeological or historic site is discovered. This is to ensure the protection of archaeological, historic, or waahi tapu sites.

Operators should be aware that Section 10 of the Historic Places Act 1993 (HPA) makes it unlawful for any person to destroy, damage, or modify, or cause to be destroyed, damaged, or modified, the whole or any part of the archaeological site (known or unknown) except with an authority granted under Section 14 of the HPA. Offence provisions under Sections 98 and 99 of the HPA apply whether or not a site is a recorded archaeological site.

Further advice on the requirements of the Historic Places Act 1993 can be sought from the local office of the Historic Places Trust in Tauranga, phone (07) 578 1281 or the national office of the New Zealand Historic Places Trust in Wellington, phone (04) 472 4341.

(j) Excess vegetation, soil, slash or other debris shall be disposed off-site where practicable, and not placed where it could readily enter the watercourse or floodway.

(k) The operator shall ensure that refuelling activities or fuel storage does not occur on the riverbed or within 20 metres of the flowing water's edge or where spillage of these contaminants can enter into water. It is the responsibility of the operator (and consent holder) to employ methods that avoid or minimise the spillage of fuel or other contaminants. This may require the provision of appropriate security and containment measures.

(l) The operator shall ensure that all machinery and material is removed to a safe site above flood level at the end of each working day, or when the site is left unattended.

(m) At the end of each working day there shall be no depressions or holes left on the excavation site.

(a) Gravel excavation should not occur on Saturdays, Sundays or public holidays unless under special circumstances (i.e. emergency works).

5.2.2 Additional Requirements for Consented Activities

If the Permitted Rules in the Operative Regional River Gravel Plan cannot be complied with (See Appendix 4), a resource consent will need to be obtained from Environment Bay of Plenty.

Operations undertaken under the authority of a resource consent will need to comply with the specific conditions outlined in the consent. Note that these may differ from those specified above for permitted activities. In addition to those conditions, operators are expected to adopt a Best Practical Option ('BPO') approach by using equipment and techniques that minimise the adverse effects of gravel excavation but still comply with the resource consent conditions. For example:

(a) When carrying out instream work, appropriate machinery for the job shall be used to carry out work as efficiently as possible, with minimal track movement and/or pushing of material within flowing water.

(b) Where excavation is required below normal water level, the excavation site shall be separated from the flowing water by a bund of at least one metre in height and one metre in width.

5.2.3 Once Works have been Completed

(a) The excavation site shall be rehabilitated so that it complements the existing landscape, aesthetic and amenity values of the surrounding area. This rehabilitation shall be to the satisfaction of the Group Manager Regulation and Resource Management (Bay of Plenty Regional Council) or their delegate.

(b) All plant, machinery, equipment, stockpiles and other material associated with gravel excavation activities is to be removed from the stream/riverbed/floodplain at the completion of the operation.

(c) At the completion of works there shall be no depressions or holes left on the excavation site that may trap fish during higher flow conditions.

(d) Access tracks to the river that existed prior to gravel excavation commencing shall be left undisturbed or where that is not possible, be reinstated once gravel excavation activities have been completed.

5.3 Monitoring, Recording and Reporting

(a) The consent holder shall keep adequate records of all materials removed from the riverbed, which shall be available on request.

(b) The contractor/consent holder shall submit to the Group Manager Regulation & Resource Management (Environment Bay of Plenty), a record of the volume of material removed from the riverbed during the period of operation, together with the appropriate management fee. The record shall be supplied in accordance with:

(i) the requirements of a consent condition, or

(ii) the requirements of the Permitted Rules of the Regional River Gravel Management Plan which specifies that records shall be supplied within 10 working days after the end of each month.

Definition of Terms

Where *italics* are used in this definition of terms, the definition is from section 2 of the Resource Management Act 1991.

Aggradation: The building up of the land surface by the deposition of fluvial or marine deposits.

Aggregate: Crushed rock or gravel screened to sizes for use in road surfaces, concrete, or bituminous mixes.

Amenity Values: *Those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.*

Archaeological Site: Any place in New Zealand that –

(a) Either –
  (i) Was associated with human activity that occurred before 1900; or

  (ii) Is the site of the wreck of any vessel where that wreck occurred before 1900; and

(b) Is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand. (Section 2, Historic Places Act 1993.)

Bed:

(a) In relation to any river—

(i) For the purposes of esplanade reserves, esplanade strips, and subdivision, the space of land which the waters of the river cover at its annual fullest flow without overtopping its banks:

(ii) In all other cases, the space of land which the waters of the river cover at its fullest flow without overtopping its banks; and

(b) In relation to any lake, except a lake controlled by artificial means,—

(i) For the purposes of esplanade reserves, esplanade strips, and subdivision, the space of land which the waters of the lake cover at its annual highest level without exceeding its margin:

(ii) In all other cases, the space of land which the waters of the lake cover at its highest level without exceeding its margin; and

(c) In relation to any lake controlled by artificial means, the space of land which the waters of the lake cover at its maximum permitted operating level; and

(d) In relation to the sea, the submarine areas covered by the internal waters and the territorial sea.

Bund: A bank or structure (usually shallow) built to contain or hold fluid discharges.

Catchment: The total area from which a single river collects surface runoff.

Coastal Marine Area: *The foreshore, seabed, and coastal water, and the air space above the water—*

(a) Of which the seaward boundary is the outer limits of the territorial sea:

(b) Of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of—

(i) One kilometre upstream from the mouth of the river; or

(ii) The point upstream that is calculated by multiplying the width of the river mouth by 5.

Construct: Includes create or build, alter, reconstruct, extend, remove and demolish.

Cross-sections: Vertical profiles of the surface contour across rivers and streams.

Erosion: The process of the wearing away of the land's surface by natural processes and human activities, and the transporting of the resulting sediment.

Excavation: Removal by extraction or separation (from the original location).

Extraction: Removal by excavation or separation (from the original location).

Flood level: The vertical height reached by flood water at a particular site.

Floodplain: The surface of relatively smooth land built of alluvium, adjacent to a river channel, and covered with water during flooding of the river.

Floodway: An artificial passage for flood water.

Flow path: The land area between the bed of a river or drain and the crest of a stopbank.

Gravel: A collective term for the material in a bed of a river. It includes sand, silt, shingle, rocks and boulders.

Greywacke: An indurated, poorly sorted sandstone or mudstone.

Heritage Place: A place may of special interest by having special cultural, architectural, historical, scientific, ecological, or other interest (refer to section 189(2) of the Act).

Heritage Values: The values associated with any place of special interest, character, intrinsic or amenity value or visual appeal, or of special significance for spiritual, cultural, scientific or historical (including archaeological) reasons.

Historic Area: *An area of land that –*

(a) Contains an inter-related group of historic places; and
(b) Forms part of the historical and cultural heritage of New Zealand; and
(c) Lies within the territorial limits of New Zealand.
(Section 2, Historic Places Act 1993.)

Historic Place:

(a) Means
(i) Any land (including an archaeological site); or
(ii) Any building or structure (including part of a building or structure); or
(iii) Any combination of land and a building or structure – that forms part of the historical and cultural heritage of New Zealand and lies within the territorial limits of New Zealand; and
(b) Includes anything that is in or fixed to such land.
(Section 2, Historic Places Act 1993.)

Infrastructure: Networks, links and parts of facility systems, as in transport infrastructure (roads, rail, parking, etc) or water system infrastructure (the pipes, pumps and treatment works, etc).

Intrinsic Values: *In relation to ecosystems, means those aspects of ecosystems and their constituent parts which have value in their own right, including (a) their biological and genetic diversity; and (b) the essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience.*

Natural Character: The qualities of the environment that give recognisable character to an area. These qualities may be ecological, physical, spiritual, cultural or aesthetic in nature. They include modified and managed environs.

Natural Environmental Regional Monitoring Network (NERMN):

A monitoring programme initiated by Environment Bay of Plenty in 1990 for the analyses of the Regions freshwater, coastal and estuarine ecology, water quality and water quantity.

Rehabilitation: To restore to a former level or state.

River: Means a continually or intermittently flowing body of fresh water, and includes a stream and modified water course; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and far drainage canal).

Sediment: Unconsolidated particulate material deposited, from a suspension, by physical, chemical or biological processes. In particular this refers to mud, silt, sand and gravel that has been deposited in the bed of a flowing river or stream.

Sedimentation: The settling out of particles (sediment) that have been transported by water.

Siltation: Infilling with silt.

Spillway: A passage in or about a hydraulic structure for escape of surplus water.

Stockpile: A pile of gravel that has been obtained from a river.

Stopbank: Barrier or embankment constructed near or alongside a river, and designed to contain flood flows and prevent high river flows flooding onto adjacent land.

Structure: *Any building, equipment, device, or other facility made by people and which is fixed to land; and includes any raft.*

Surface Waterbody: Means freshwater in a river, lake, stream, pond, wetland or drain that is not located within the coastal marine area.

Stream crossing: Any structure supporting a path, road or track over a streambed including culverts, fords and bridges.

Temporary Stockpile: A stockpile that only exists while the site is being actively worked.

Territorial Authority: A district council or a city council (as defined in the Local Government Act 2002).

Watercourse: The natural path that water in any river or stream follows over the land surface.

Water Body: Means *fresh water or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not located within the coastal marine area.*

Water's edge: The boundary between the water in a river or stream and the adjoining dry land.

References

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Pak, I (2003) Natural Environment Regional Monitoring Network River and Stream Channel Monitoring Programme 2000/2001 and 2001/2002, Environmental Publication 2003/16, Environment Bay of Plenty.

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Appendices

Appendix 1 – Shingle Extraction Bay of Plenty

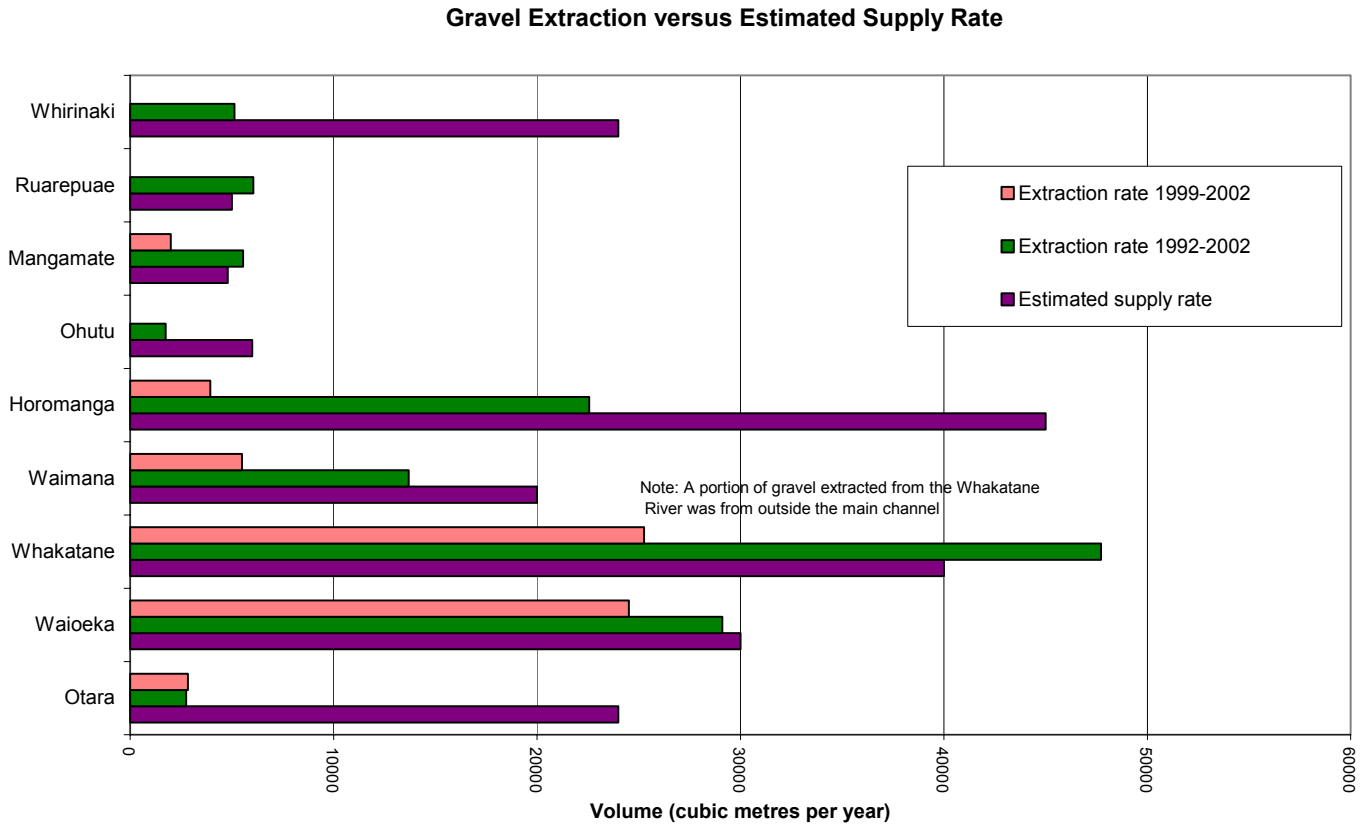
SHINGLE EXTRACTION BAY OF PLENTY 2001/2002

River	Location	Expiry	Consent No	Site	Contractor	Shingle Extracted				Subtotal	Cumulative Total
						Sep-01	Dec-01	Mar-02	Jun-02		
Whakatane River											
	Below Pekatahi										
	Van Boheman	31/05/02	06 0232	1	J Swaps	0	0	0	0	**0**	**0**
	Blacks	30/04/00	06 0235	1	Tracks	176	1123	656	1527	**3482**	**3482**
	Sykes	31/10/96	05 0372	1	Waiotahi	2388	0	0	5909	**8297**	**11779**
	Pekatahi To Ruatoki Bridge										
	Lyfords		05 0372	1	Waiotahi	0	0	0	0	**0**	**11779**
	Reids Rd	31/10/96	05 0372	3	Waiotahi	5093	0	5710	0	**10803**	**22582**
	Lillas			4						**0**	**22582**
	Rawson			5						**0**	**22582**
	Richardsons	31/10/96	05 0372	7	Waiotahi	0	0	0	0	**0**	**22582**
	Yeoman			9						**0**	**22582**
	Davies			10						**0**	**22582**
	Mahurihuri	31/10/96	05 0372	11	Waiotahi	0	0	0	0	**0**	**22582**
	Above Ruatoki Bridge										
	Te Kaiti Trust	31/10/96	05 0372	12	Waiotahi	0	0	0	0	**0**	**22582**
	Ngati Rongo	31/10/96	05 0372	13	Waiotahi	0	0	0	0	**0**	**22582**
	Opurana	31/10/96	05 0372	14	Waiotahi	0	0	0	0	**0**	**22582**
	Limeworks	31/10/96	05 0372	15	Waiotahi	0	0	0	0	**0**	**22582**
	Waikirikiri	31/10/96	05 0372	16?	Waiotahi	0	0	0	0	**0**	**22582**
Waimana River											
	Below Ruddicks Rd Bridge										
	Waimana Gorge, Dunstans 1									**0**	**22582**
	Waimana Gorge, Dunstans 2			2	Waiotahi	0	1254	52	0	**1306**	**23888**
	Wardlaw Rd	30/11/96	05 0449	2	Wilson Brothers	0	1100	0	0	**1100**	**24988**
	Waimana Gorge, Dunstans 3			3	Waiotahi	0	0	304	0	**304**	**25292**
	Waimana Gorge, Dunstans 4			4	Waiotahi	0	0	0	0	**0**	**25292**
	Wardlaw/Ruddicks			5	Waiotahi	0	0	0	0	**0**	**25292**
	Above Ruddicks Rd Bridge										
	Flemings/Clarks		05 0371		Waiotahi	3777	0	0	0	**3777**	**29069**
	Above Waimana Bridge										
	Tanatana/Rokuraku (Bells Rd)		05 0449		Wilson Bros	0	0	0	0	**0**	**29069**
	Lowes									**0**	**29069**
	Mexteds									**0**	**29069**
	Lowes/Mexteds	30/11/96	05 0449	1	Wilson Brothers	0	0	1766	1550	**3316**	**32385**
	Lowes/Mexteds	31/10/96	06 0284	7	Waiotahi	0	0	0	0	**0**	**32385**
	Claytons	31/10/96	06 0284	8	Waiotahi	0	0	0	2114	**2114**	**34499**
	Len Browns	31/10/96	06 0284	9	Waiotahi	0	0	0	0	**0**	**34499**
Horomanga River											
	Above Troutbeck Rd										
	Galatea Road Bridge	31/08/08	05 0706	10	Waiotahi	0	0	0	0	**0**	**34499**
	Galatea Road Bridge	30/09/01	05 0737	1	Edelsten	0	0	0	0	**0**	**34499**
	Galatea Road Bridge	31/08/08	05 0706	1	Waiotahi	0	0	0	0	**0**	**34499**
	Troutbeck Rd	30/11/03	05 0828		Wilson Bros	3000	0	5204	0	**8204**	**42703**
	Troutbeck Rd	30/06/04	05 0851	1	Robinsons Transport	0	0	0	0	**0**	**42703**
	Troutbeck Rd	30/06/04	06 0300	1	Robinsons Transport	0	0	0	0	**0**	**42703**
Mangamate Stm											
	Troutbeck Rd	30/06/04	06 0300	1	Robinsons Transport	0	0	0	0	**0**	**42703**
	Troutbeck Rd		05 0828	1	Wilson Bros	0	0	0	6007	**6007**	**48710**
Kopuriki Stm											
	Blacks	31/08/08	06 0023	1	Waiotahi	0	0	0	0	**0**	**48710**
	Galatea Road Bridge	30/09/01	05 0737	1	Edelsten	0	0	0	0	**0**	**48710**
Waikokopu Stm											
	Galatea Road	30/06/03	05 0706		Waiotahi	0	0	0	430	**430**	**49140**
Waihui Stream											
	Ruatahuna	30/04/00	06 0443	1	Waiotahi	628	0	0	0	**628**	**49768**
Waioeka River											
	S/Highway 2 Bridge	31/01/02	05 1060	1	E·B·O·P/M Kennon	0	0	0	0	**0**	**49768**
	S/Highway 2 Bridge	01/06/99	05 1060	1	E·B·O·P/Works Infrastructure	1800	0	0	416	**2216**	**51984**
	S/Highway 2 Bridge	31/12/99	05 1060	1	E·B·O·P/Waiotahi	520	0	0	0	**520**	**52504**
	Petersons (Robbie's)	01/06/99	05 0705	3	E·B·O·P/Waiotahi	1252	1968	12	4513	**7745**	**60249**
	S/Highway 2 Bridge	31/01/02	05 1060	2	E.B.O.P/Eastern Bay Concrete	50	0	80	40	**170**	**60419**
	S/Highway 2 Bridge	31/12/99	05 1060	2	E·B·O·P	0	0	0	0	**0**	**60419**
	B Smith		05 1060		E·B·O·P	2861	1894	0	0	**4755**	**65174**
	Youngs	01/06/99	05 1060	4	E·B·O·P	2481	0	0	0	**2481**	**67655**
	Browns	01/06/99	05 1060	5	E·B·O·P	0	1524	0	0	**1524**	**69179**
	Browns Pipeline	01/06/99	05 1060	6	E·B·O·P	0	0	0	0	**0**	**69179**
	Opotiki Depot	01/06/99	05 1060	7	E·B·O·P/Waiotahi	4432	0	4335	0	**8767**	**77946**
	Michaels	30/04/02	06 0304		Waiotahi	72	0	0	0	**72**	**78018**
	Maxwell			7						**0**	**78018**

	Youngs	31/12/02	05 1060	8	E·B·O·P - ORS	0	0	0	0	**0**	**78018**
	Graemes Bridge	31/12/02	05 1060	9	EBOP - ORS	429	0	0	0	**429**	**78447**
	Wairata	31/12/02	05 1060	10	EBOP - ORS	0	0	0	0	**0**	**78447**
Otara River											
	Gows Road	31/01/02	05 1061	1	E·B·O·P - ORS	0	0	0	0	**0**	**78447**
	Gows Road	31/01/02	05 1061	1	E·B·O·P - ORS	0	0	0	0	**0**	**78447**
	Gows Road	31/01/02	05 1061	1	E·B·O·P - ORS	0	0	0	0	**0**	**78447**
	Carters	31/01/02	05 1061	1	E.B.O.P - ORS/EBC	205	200	200	185	**790**	**79237**
	Goult	31/12/02	05 1061	2	E·B·O·P - ORS	0	0	0	0	**0**	**79237**
	Lockhead		?	3	E·B·O·P-Waiotahi Contractors	0	0	0	0	**0**	**79237**
	EBA5	31/12/99	05 1061	3	E·B·O·P-Works Infrastructure	0	0	0	0	**0**	**79237**
	Carters	?	05 1061	4	E·B·O·P-Waiotahi Contractors	446	112	0	12831	**13389**	**92626**
	Carters	?	05 1061	4	E·B·O·P-M Kennon	583	0	213	0	**796**	**93422**
	Carters	31/12/02	05 1061	4	E·B·O·P - ORS	0	0	0	0	**0**	**93422**
	Kellers	31/12/02	05 1061	5	E·B·O·P - ORS	0	0	0	0	**0**	**93422**
	Kellers	31/12/02	05 1061	5	E·B·O·P - ORS	0	0	0	0	**0**	**93422**
	Kellers	31/12/02	05 1061	5	E·B·O·P - ORS	0	0	0	0	**0**	**93422**
	M Brown	31/12/02	05 1061	6	E·B·O·P - ORS	0	0	0	0	**0**	**93422**
	Watsons	31/12/02	05 1061	?	E·B·O·P - ORS	0	0	0	0	**0**	**93422**
Waiotahi River											**93422**
	Youngs		05 0448	1	Wilson Brothers	0	0	0	0	**0**	**93422**
East Coast Rivers											**93422**
Hawai River											**93422**
	SH35 Bridge									**0**	**93422**

Total	**30193**	**9175**	**18532**	**35522**	**93422**	**93422**

Appendix 2 – Gravel Extraction Versus Estimated Supply Rate



Appendix 3 – Excavation Levels on the Whakatane River

Whakatane River above Pekatahi Bridge

Resurveys were completed in February 2002. Again, at cross-sections 25a to 44 the analysis was run on the full width as well as the "active channel" width, where the gravel is assumed to be mainly stored. In the braided reach above cross-section 44 this distinction has not been made as the gravel can potentially be stored throughout the cross-section.

Significant gravel extraction is carried out in this reach (above the Pekatahi Bridge) of the river, however, the amount taken is mainly decreasing from year to year: In 2000/2001 and 2001/2002, 24,600m^3 and 16,900m^3 respectively, were removed, compared to 20,400m^3 in 1999/2000, 39,700m^3 in 1998/99 and 59,400m^3 in 1997/98. Average extraction on the whole river since 1996 is around 38,400m^3 per year, of which 37,100m^3 has been extracted from above the Pekatahi Bridge. A portion of the extraction has been from outside the "design channel", to allow bed levels to aggrade in some places. Staff undertake regular visual inspections to monitor gravel extraction and in some areas extractions have ceased.

Within the active channel, there has been a gain of 40,267m^3 between 1998 and 2000 whilst, the gain between April and December 1998 was 18,551m^3. In between 1998 and 2000, major gains were made at cross sections 30 and 33b, with around 22,000m^3 and 12,000m^3 deposited respectively. On cross-sections 58 and 59 the left side of the bank has eroded heavily, while the right bank has been built up somewhat. Sections 60 and 61 have heavy erosion on their right banks with build up on the left. This suggests the beginning of a change in the rivers meander pattern.

For the active channel width between cross-section 25a and 44, the 2002 survey shows a **volume gain of 78,000m^3** since the previous survey in 2000. Again, major gains were observed at cross-section 30 with over 12,000m^3, and at cross-sections 28 and 37 with over 9,000m^3 each. A long-section plot of the minimum bed levels confirms that the river is recovering with significant aggradation in this reach.

Within the full floodplain width of the river, the last NERMN report has noted an overall loss of 77,900m^3 between the 1998 and 2000 survey. This figure was calculated using some incomplete cross-section surveys and has been revised for this report. By adjusting the offset limits in order to exclude those incomplete parts of the survey, the calculated volume changes differ from the ones calculated in the previous report and result in an overall **volume gain of 55,000m^3** for the period December 1998 to September 2000. The largest volume gains were at cross-sections 26, 27 (Pekatahi Bridge) and 55.

The 2002 survey shows that since the 2000 survey there has been again a **volume gain of 92,000m^3** within the full floodplain width of the river. The largest volume gains are around cross-sections 44 and 45 with 21,200m^3 and 20,000m^3 respectively. Volume losses were observed at cross-section 31, where a shingle pit on the right floodplain affects the volume calculations, 32, 38, 39, and 51 to 56. Bed levels have dropped in the reach of cross-sections 51 to 57 (except at cross-sections 54), and have risen at cross-sections 47 and 48. Bank erosion has occurred at the right bank of cross-section 53 and 54.

The long-term extraction rate for this part of the river has decreased from an estimated 72,000m^3 per year over the last 20 years to around 48,000 m^3 over the past ten years. The estimated supply rate is around 40,000 m^3.

For the integrity of the existing bank protection works, an ideal minimum bed level was estimated in 1996 to be between the 1996 minimum bed level at each cross-section and 0.5m higher, i.e. some recovery was desired along most of the river. In places, the ideal bed level may be higher still, so as the recovery target is approached, a careful review of desirable levels will be required, (based on balancing the risks of erosion, aggradation and flooding). It is proposed that until adequate recovery is achieved, extraction should be suspended within the active channel over the reach from approximately 1 km upstream of the confluence of the Waimana River to Ruatoki Bridge and also in the lower reaches of the Waimana River.

A comparison of the 2002 survey to the 1996 survey shows that the minimum bed levels have risen by up to one metre over most of the river reach, except at cross-section 49, 54, and 55, where it has dropped by about half a metre. A significant rise of almost four metres occurred at cross-section 47, where the main channel has been filled in over time. Whilst thalweg levels are improving, a significant volume of gravel is required to effect the recovery of bed levels yet.

A limit for the active river of around 20-30,000m^3 per year from the existing beaches should continue to aid recovery over the next few years - any extra demand should be met by widening the floodway where appropriate (e.g., extraction should target where the river floodway are deem too narrow ahead of traditional beaches). There are significant resources available in some areas. Following the large input of gravel in 1998, it is likely that some beaches and floodway constrictions will develop where extraction is desirable, especially above Ruatoki. However, it is also desirable that some throughput to the rest of the river is allowed.

There is a diversity of viewpoints on how the gravel in the vicinity of the Holmes bend should be managed. On the one hand there is strong pressure for the extraction in this reach to be ceased until bed levels recover and bank erosion problems are reduced, both through the reach and downstream. Management was adjusted during the 1990's to encourage recovery of bed levels. This viewpoint was again strongly enunciated following significant erosion during the July 1998 floods at the Holmes bend. Factors causing this erosion were several, including undermining caused by lower than optimum bed levels, the extreme nature of the succession of events (cumulatively at least a one in one hundred years event) and severe sharpness of the bend. This recovery has already occurred in the first one kilometre above the confluence with the Waimana River. The July 2002 survey shows levels upstream of this to also be showing some recovery. On the other hand there is a view that the river should remain entrenched to avoid the severe adverse effects forecast from overflows onto the surrounding farmland. This occurred several times in the 1960s, with large scale deposition of silt and debris. Had the river not been entrenched in July 1998 similar adverse effects were likely. It is difficult to exactly balance these opposite objectives. Current river management practices also focus on emulating the natural processes of a river as far as practicable, as these have been shown to often produce the least adverse effects in terms of erosion (although not always, particularly where adverse river misalignments occur due to geological or other factors). In the meantime the policy of allowing some bed recovery should continue, with careful monitoring. Possibly a hydraulic model of the reach should be produced to define optimum bed levels.

Whakatane River below Pekatahi Bridge

The Whakatane River below Pekatahi Bridge has not been resurveyed since 1998. The amount of gravel extracted during 2000/2001 and 2001/2002 was 1,657 m^3 and 9,391 m^3, respectively.

A comparison of changes within the design channel above section 15 (assumed to be gravel), reveals a net deposition of 99,000m3 from 1990 to 1998. The largest increases have been at cross-sections 17a, 18 and 24 to 24/25; at these sections particularly from 1996 to 1998. (A larger but more general increase occurred from 1993 to 1996). From 1963 to 1990, there was little overall change; sections 16, 17a and 24/25 went down while most other sections went up. The volume analysis indicates that a general loss from 1977 to 1985 has been regained by 1999.

The 1999 NERM report observed that over the full width of cross-sections and the whole reach to the mouth, there has been a substantial 190,000m^3 loss of material since 1996. The lower 8 km of the river (except section 1), has lost 383,000m^3 of material, while the next 10 km has gained 193,000m^3 of material (about 41,000m^3 of this is assumed to be gravel). The loss of material from lower reaches is likely to result in an increased tidal prism encouraging movement of water through the river mouth, but may also increase erosion if deep pools have been created.

Substantial deposition of material must have occurred at or just beyond the Whakatane River mouth as a result of the floods in July 1998. A rough measure of the quantity deposited can be made by adding the estimated suspended sediment transported past the Valley Rd recorder station (3.3 million tonnes, equivalent to about 1.6 million cubic metres in situ), to the loss of material below this point (320,000m^3). This gives a total of around 2 million cubic metres. This material is now providing good replenishment to the beach at Ohope, particularly at West End.

There is a diversity of viewpoints on how the gravel in the vicinity of the Holmes bend should be managed. On the one hand there is strong pressure for the extraction in this reach to be ceased until bed levels recover and bank erosion problems are reduced, both through the reach and downstream. Management was adjusted during the 1990's to encourage recovery of bed levels. This viewpoint was again strongly enunciated following significant erosion during the July 1998 floods at the Holmes bend. Factors causing this erosion were several, including undermining caused by lower than optimum bed levels, the extreme nature of the succession of events (cumulatively at least a one in one hundred years event) and severe sharpness of the bend. This recovery has already occurred in the first one kilometre above the confluence with the Waimana River. The July 2002 survey shows levels upstream of this to also be showing some recovery. On the other hand there is a view that the river should remain entrenched to avoid the severe adverse effects forecast from overflows onto the surrounding farmland. This occurred several times in the 1960s, with large scale deposition of silt and debris. Had the river not been entrenched in July 1998 similar adverse effects were likely. It is difficult to exactly balance these opposite objectives. Current river management practices also focus on emulating the natural processes of a river as far as practicable, as these have been shown to often produce the least adverse effects in terms of erosion (although not always, particularly where adverse river misalignments occur due to geological or other factors). In the meantime the policy of allowing some bed recovery should continue, with careful monitoring. Possibly a hydraulic model of the reach should be produced to define optimum bed levels.

Appendix 4 – Operative Regional River Gravel Plan Rules

15 Rules

15.1 Introduction

Para 1 Activities in the beds of rivers are controlled under Section 13 of the Resource Management Act 1991 unless specifically allowed by a rule in a regional plan, in any relevant proposed regional plan or a resource consent. Section 30(1)(c)(v) of the Resource Management Act 1991 also gives regional councils the function of controlling the use of land for the purpose of the avoidance or mitigation of natural hazards.

Para 2 This plan provides for the controlled excavation of gravel from the beds of rivers in order to assist Environment B·O·P in carrying out its river and flood management functions under the Resource Management Act 1991. The rules in this plan do not, however, absolve any persons undertaking gravel excavation from any common law liabilities. Consequently any person wishing to undertake gravel excavation will, prior to the excavation activity being undertaken, need to obtain:

(1) A land use consent, if required, from Environment B·O·P for river gravel excavation pursuant to Section 13(1)(b) of the Resource Management Act 1991 (see the rules which follow) and the requirements of the Regional Land Management Plan.

(2) A land use consent, if required, from the relevant territorial authority pursuant to Section 9 of the Resource Management Act 1991 (see the relevant district plan).

(3) Approval from the owner[1] of the gravel, and

(4) Permission from relevant landowners across whose property the gravel will need to be transported.

Para 3 The rules are to be used in conjunction with the definitions outlined in the Glossary (section 20.

NOTE 1 The modification of any archaeological site requires an authorisation from the Historic Places Trust and may also require a resource consent from the relevant territorial authority.

Para 4 The following consent categories apply to gravel excavation activities:

[1] See Appendix 2 for information on gravel ownership. Aboriginal title may be an issue.

15.2 Permitted Activities

Any river gravel excavation activity that cannot meet the conditions specified for permitted activities under rules 1, 2 or 3 shall be assessed as a discretionary activity under rule 4.

Rule 1 Subject to the following conditions the excavation and removal of up to 100 cubic metres per calendar year of river gravel from the dry part of any aggraded gravel beach[2] in the bed of a river within the Bay of Plenty region is a **permitted activity.**

Conditions:

(1) Notification shall be made in writing to the Group Manager, Regulation & Resource Management, Environment B·O·P at least 5 working days before any gravel excavation activities are undertaken. This notification shall include a statement containing the location of the site from where the gravel is to be excavated, the quantity of gravel to be excavated and the dates when the excavation activity is to be undertaken;

(2) Gravel shall only be excavated from the dry parts of the gravel beach that are more than 0.3 metres above the level of the adjacent river at that time;

(3) The excavation shall not leave holes in the riverbed at the end of each working day or leave stockpiles of gravel on the riverbed on completion of the excavation activity;

(4) Gravel shall not be taken within one metre horizontal distance from the river bank or otherwise weaken the flood control functions of that bank;

(5) The gravel excavation shall not adversely affect river alignment or grade and shall not cause erosion or instability to the banks or the bed of the river. The activity shall not obstruct the free flow of water in such a manner where it results in a blockage, flooding or erosion;

(6) Best management practices shall be applied so that vehicle crossings of the river are minimised and those that are essential are carried out in the least environmentally damaging manner;

(7) Vehicle travel along riverbeds shall not involve any earthworks or vegetation removal;

(8) Stream crossings (including culverts, culvert extensions, bridges and fords) required as part of any gravel excavation removal activity shall comply with the requirements of Section 10.5.6 of the Regional Land Management Plan;

(9) Fuel and oil storage and machine refuelling shall not be undertaken on the bed of a river or in any other place where the spillage of these contaminants can enter into water;

(10) All practicable measures shall be taken to avoid vegetation, soil, slash or any other debris being deposited in a water body or place in a position where it could readily enter or be carried into a water body;

[2] Gravel beaches are raised areas where gravel has been deposited and occur predominantly on the inside of the elbows or bends in the river.

(11) The gravel excavation shall not adversely affect any significant ecological values; fish spawning and passage and bird nesting sites; and

(12) The activities shall ensure the protection of any archaeological, historic, or waahi tapu sites;
Activities shall immediately cease should any archaeological or historic site be discovered as a result of the activity, until appropriate authorisation is received.

Rule 2

Subject to the following conditions the excavation and removal of river gravel from, or where necessary it's placement on that part of the riverbed not covered by water is a **permitted activity** provided it is undertaken by or on behalf of Environment B·O·P while exercising it's river management, flood protection or flood control functions under the Soil Conservation and Rivers Control Act 1941, for the purpose of achieving desired river meander pattern, location, alignment and bed grade.

Conditions:

(1) The quantity of river gravel that may be excavated from or placed on any gravel beach[3], that has a minimum natural bed[4] width of less than 25 metres in the vicinity of any part of that beach, shall not exceed 1,000 cubic metres provided that when that quantity is aggregated with the gravel that has been excavated under this Rule from any place in the bed of that river[5] during the previous 12 months shall not exceed 3,000 cubic metres;

(2) The quantity of river gravel that may be excavated from or placed on any gravel beach[10], that has a minimum natural bed[11] width equal to or greater than 25 metres in the vicinity of any part of that beach, shall not exceed 2,500 cubic metres provided that when that quantity is aggregated with the gravel that has been excavated under this Rule from any place in the bed of that river[12] during the previous 12 months shall not exceed 7,500 cubic metres;

(3) Notification shall be made in writing to the Group Manager, Regulation & Resource Management, Environment B·O·P at least 5 working days before any gravel excavation activities are undertaken. This notification shall include a statement containing the location of the excavation site, the quantity of gravel to be excavated and the dates when the excavation is to be undertaken. Prior to any gravel excavation being undertaken under this rule, the person carrying out the activity will advise the Department of Conservation, Eastern Region Fish and Game Council and any relevant river scheme liaison committee, relevant iwi authority or any other party Environment B·O·P considers are affected, of the proposed gravel excavation activity;

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[3] Gravel beaches are raised areas where gravel has been deposited and occur predominantly on the inside of the elbows or bends in the river.

[4] See definition of the bed of a river in the Glossary. "Natural" implies that the bed is not artificially widened or narrowed. For example artificial narrowing could result from the construction or placement of a bridge abutment.

[5] Rivers in condition (1) and (2) above apply to those named and identified on the NZMS 260 1:50,000 mapping series.

(4) Within ten working days of the end of every month during which gravel excavation activities are undertaken accurate records of the quantity of material excavated from the river system shall be supplied to the Group Manager, Regulation & Resource Management, Environment B·O·P;

(5) Gravel shall not be taken within one metre horizontal distance from the river bank or otherwise weaken the flood control functions of that bank;

(6) Gravel shall only be excavated from, or placed on, dry gravel beaches that are more than 0.3 metres above the water level in the adjoining river at the time the excavation or deposition is being carried out. (Note: To remove gravel that is below water or less than 0.3 metres above the water level in the adjoining river at the time the excavation is being undertaken requires a discretionary resource consent from Environment B·O·P as specified under Rule 4);

(7) Machinery used to excavate gravel shall not operate on the parts of the riverbed that are covered by water;

(8) Vehicle travel and gravel transport in, across or along waterbodies, rivers or streams shall be avoided. Where it is not possible to travel across or along the dry river or streambed, best management practices shall be applied to minimise travel through water so that they are carried out in the least environmentally damaging manner. Notification shall be given by the person carrying out the activity, to the Department of Conservation and Fish and Game New Zealand before any vehicle or equipment travel or gravel transport through rivers is carried out. The following crossings are excluded and required a resource consent from Environment B·O·P:

- stream or river crossing that occur during the trout spawning and hatching season of 1 May to 31 October, or
- crossings that exceed five consecutive days during the whitebait migration season of 15 August to 30 November in any year;

(9) Vehicle travel along the dry parts of riverbeds shall not involve any earthworks or vegetation removal;

(10) Stream crossings (including culverts, culvert extensions, bridges and fords) required, as part of any gravel excavation removal activity shall comply with the requirements of Section 10.5.6 of the Regional Land Management Plan.;

(11) The excavation shall not cause erosion or instability to the banks or beds of rivers*;*

(12) Fuel and oil storage and machine refuelling shall not be undertaken on the bed of a river or in any other place where the spillage of these contaminants can enter into water;

(13) The excavation activity shall not obstruct the free flow of water in such a manner that it results in a blockage or flooding of the river or erosion of the banks of any water body;

(14) The excavation shall:

(a) At the end of each working day;

(i) not leave holes in the riverbed; or
(ii) not store temporary stockpiles in the flood way.

(b) Not locate temporary stockpiles within 20 metres of the flowing waters edge.

On the completion of the excavation activity no stockpiles of gravel, plant, machinery or equipment are to be left on the riverbed;

(15) All practicable measures shall be taken to avoid vegetation, soil, slash or any other debris being deposited in a water body or place in a position where it could readily enter or be carried into a water body;

(16) The excavation shall not impede public access to and along the river except for temporary restrictions necessitated by operational health and safety requirements;

(17) Gravel excavation and deposition shall not adversely affect any significant ecological values, fish spawning and fish passage or bird nesting sites; and

(18) The activity shall immediately cease, should any archaeological or historic site be discovered as a result of the activity, until appropriate authorisation is received. This is to ensure the protection of archaeological, historic, or waahi tapu sites.

Rule 3 Any river gravel excavation activity or related disturbance of the bed of a river that meets the requirements of and is permitted under either Rule 10.5.8.2 or Rule 10.5.8.3 of the Regional Land Management Plan is a permitted activity under this plan.

15.3 Discretionary Activities

Rule 4 Any river gravel excavation activity or any related disturbance of the bed of a river that is not a permitted activity in accordance with either Rule 1, 2 or 3 above is a discretionary activity. Discretionary activity consent applications will be assessed using the Assessment Criteria in section 16 and any other matter in section 104, Resource Management Act 1991.

All applications for discretionary activities will be publicly notified unless the applicant has obtained written approval from all affected parties and has demonstrated that the adverse effects on the environment are minor.